Teachers'
Retirement System,
State of Montana
actuarial
evaluation as of
July 1

# TEACHERS' RETIREMENT SYSTEM

# STATE OF MONTANA

# ACTUARIAL VALUATION

# AS OF

# JULY 1, 1977

# INTRODUCTION

In accordance with Chapter 62, Section 75-6205 of the Teachers' Retirement Law, an actuarial valuation of the Teachers' Retirement System of the State of Montana has been completed. The purpose of this valuation was to determine the position of the fund, the normal cost, and the unfunded accrued liability based on present and prospective assets and liabilities of the System as of July 1, 1977.

The valuation was based on employee data and other records maintained by the System as of June 30, 1977, and incorporates all amendments of the Retirement Law as of July 1, 1977.

This report presents the results of the valuation.

## Actuarial Certification

Based upon the assumptions stated herein and the data maintained by the Teachers' Retirement System, the actuarial valuation has been performed in accordance with generally accepted actuarial principles and techniques.

Alton P. Hendrickson

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Associate of the
Society of Actuaries

## ANALYSIS OF VALUATION

As a result of the valuation which was conducted as of July 1, 1977, we have concluded that the Montana Teachers' Retirement System is funded on an actuarially sound basis. The present contribution rate of 12.499% of salaries is sufficient to finance the cost of the benefits as they accrue in the future as well as to amortize the current unfunded liability over a period of 43 years and 9 months.

On July 1, 1977, benefit increases were granted to teachers who had retired prior to July 1, 1971. This legislative change increased the liabilities of the system. To finance these additional liabilities, the statutory contribution rates were increased from 12.375% of salaries to 12.499%, with an employer rate of 6.312% and an employee rate of 6.187%. This valuation has determined that the additional contribution of .124% of salaries is sufficient to support the additional liabilities.

In preparing this actuarial report, we conducted two studies pertaining to the actuarial assumptions, including the present rates of termination by teachers and the average age at which teachers are currently retiring.

### Termination Rates

The previous study of termination rates was based upon data during the five year period 1966 through 1971. Our recent study examined the years 1975 and 1976. This period was selected because of the availability of statistics maintained by the Teachers' Retirement System on its new computer processing system. There was no data available on the computer for years prior to 1975. Also, the data for 1977 was determined to be inadequate inasmuch as a full 12 month period was not available.

Our study indicated that the rates of termination by teachers has decreased significantly since the original study. It appears that this decrease was attributable to three factors:

1. The current unemployment situation along with a full supply of qualified teachers has made jobs less available and therefore diminished the mobility of teachers.

2. The improvement in teachers' salaries as well as retirement benefits has given greater incentive to remain in the teaching profession.

3. The data available on active members in the previous study may have been incomplete. This would have tended to have shown a higher rate of termination than was actually experienced by the Teachers' Retirement System. The new computer processing system has increased the accuracy of this study.

In studying the termination rates assumed in the valuation, consideration was given to the fact that many of the teachers who withdraw their funds from the system return to teaching and have their previous credit restored by repaying the amount of their refund with interest. The termination of these teachers does not represent an actuarial gain to the system.

As a result of our study, we determined that it was necessary to modify the current termination assumptions and to set new assumptions in accordance with our findings. The result of this change was to increase the liability of the Teachers' Retirement System. This liability increase was partially offset by the fact that larger contributions are expected in the future because of the decrease in withdrawals.

## Retirement Ages

In recent years, legislation has been passed which allows teachers to retire at earlier ages. We used computerized data in conducting a study to determine if there has been any change in the trend toward early retirement. The conclusion of our study was that teachers are retiring at an earlier age and that the average retirement age in recent years has been approximately age 62½. This represents a 1½ year drop from age 64 which was the average retirement age determined in the 1971 study. It appears that average retirement ages are remaining around age 62 because social security benefits are not available until that age.

Based upon this study, we reduced the average retirement age to age 62. This actuarial assumption also increased the liability somewhat.

## Other Factors

In addition to the legislative change and assumption revisions noted above, several other factors were instrumental in increasing the liabilities of the system. The average salaries paid to teachers increased approximately 21% during the last two years. The membership of the system also increased 7.3% . These two factors combined resulted in an increase in payroll of 30%.

The improved retirement benefits and the increase in the number of inactive members resulted in a 55% increase in benefits paid to the inactive members.

The investment yield has been larger than the investment rate assumed in the actuarial valuation which has helped to offset the increased costs of the program.

## METHOD OF FUNDING

The method of funding employed is commonly referred to as the "entry-age normal cost method". This method establishes a "normal cost" for each member as well as an unfunded accrued liability. The annual normal cost is the level percentage of annual salary required to fund the benefits assuming this percentage had been contributed since the member's entry into the System.

The unfunded accrued liability represents the liability for accrued benefits which has not been previously funded. This liability can arise from four sources:

(1) If the member began teaching prior to the establishment of the System (1937), and thus did not contribute during the prior years;

(2) If the member received additional credit which was not funded or only partially funded, such as military service and out-of-state teaching credit;

(3) If benefits were increased for which no funding had been previously made;

(4) If actuarial losses were incurred when actual experience varied from expected experience.

In order to maintain the System on an actuarially sound basis, the total rate of contribution should be such as to meet the normal costs in addition to making progress toward the amortization of the unfunded accrued liability.

## ACTUARIAL ASSUMPTIONS

Since the true cost of the retirement plan will be directed by its own experience, certain assumptions must be made as to the expected experience. The following is a summary of the assumptions used in the valuation:

### Mortality Rates

The mortality rates for males and females are based upon a published table referred to as the 1971 Group Annuity Mortality Table.

Rates of Mortality

| Age | Female | Male |
|---|---|---|
| 25 | .042% | .064% |
| 30 | .056 | .083 |
| 35 | .078 | .115 |
| 40 | .112 | .168 |
| 45 | .167 | .300 |
| 50 | .257 | .543 |
| 55 | .390 | .875 |
| 60 | .657 | 1.304 |
| 65 | 1.140 | 2.048 |
| 70 | 1.937 | 3.296 |
| 75 | 3.849 | 5.423 |
| 80 | 6.752 | 9.077 |
| 85 | 10.720 | 14.015 |
| 90 | 16.433 | 20.059 |

### Disability Rates

The disability rates for males and females are based upon the male ordinary disability rates published by the Railroad Retirement Board in its eighth valuation.

Rates of Disability

| Age | Female | Male |
|---|---|---|
| 25 | .015% | .015% |
| 30 | .015 | .015 |
| 35 | .020 | .020 |
| 40 | .045 | .045 |
| 45 | .095 | .095 |
| 50 | .170 | .170 |
| 55 | .310 | .310 |

## Withdrawal Rates

The withdrawal rates are based upon the actual experience of the Teachers' retirement System during 1975-76.

| Age | Rates of Withdrawal |
|---|---|
| 25 | 18.1% |
| 30 | 13.7 |
| 35 | 10.6 |
| 40 | 8.1 |
| 45 | 5.6 |
| 50 | 3.1 |
| 55 | 1.9 |

## Salary Scale

The rates of salary increase are based upon a study conducted in 1975 on base salary increases by age as a result of longevity. In addition to the base increases, an inflationary increase of 5% per annum is assumed.

| | Expected Final Salary at Age 60 As a Multiple of Current Salary | |
|---|---|---|
| Age | Female | Male |
| 20 | 10.59 | 12.07 |
| 25 | 7.39 | 8.22 |
| 30 | 5.12 | 5.53 |
| 35 | 3.70 | 3.92 |
| 40 | 2.78 | 2.89 |
| 45 | 2.13 | 2.18 |
| 50 | 1.65 | 1.66 |
| 55 | 1.28 | 1.28 |
| 60 | 1.00 | 1.00 |

## Retirement Rates

Based upon the actual experience of the Teachers' Retirement System during 1975-76, retirements were assumed to occur at an average age of 62. The retirement age was appropriately extended for those members with less than 5 years of service at age 62 and for those members who have already attained age 62.

## Investment Earnings

An annual rate of 6¼% is assumed for future investment earnings.

## Expenses

Administrative expenses are to be paid from investment income in excess of the assumed rate of 6¼%.

## Assets

The security investments are valued at amortized book value. The real estate mortgages are valued at full principal value.

## SCHEDULE I

NORMAL COST ALLOCATION

| | Contribution Rate | | |
|---|---|---|---|
| | Female | Male | Total |
| Retirement | 5.859% | 5.027% | 5.389% |
| Death | .481 | .885 | .709 |
| Disability | .318 | .287 | .300 |
| Vested | 1.178 | 1.087 | 1.127 |
| Return of Contribution | .990 | .694 | .823 |
| Total | 8.826% | 7.980% | 8.348% |

| | | |
|---|---|---|
| (1) | Present Value of Future Salaries of Present Members | $2,238,264,339 |
| (2) | Normal Cost Contibution Rate | 8.348% |
| (3) | Present Value of Future Normal Costs for Present Members ((1) x (2)) | $ 186,850,307 |

## SCHEDULE II

### UNFUNDED ACCRUED LIABILITY ALLOCATION

| | | |
|---|---|---|
| (1) | Present Value of Benefits (Schedule III) | $ 650,534,903 |
| (2) | Present Value of Future Normal Costs (Schedule I) | 186,850,307 |
| (3) | Trust Fund Assets (Schedule IV) | 142,973,994 |
| (4) | Unfunded Accrued Liability ((1)-(2)-(3)) | $ 320,710,602 |

Amortization over 40-year Period

| | | |
|---|---|---|
| (5) | Present Value of Salaries of Members during next 40 Years | $7,212,495,854 |
| (6) | Unfunded Accrued Liability Contribution Rate ((4) by (5)) | 4.447% |
| (7) | Normal Cost Contribution Rate (Schedule I) | 8.348 |
| (8) | Required Contribution Rate | 12.795% |

Current Period of Amortization (43 9/12 Years)

| | | |
|---|---|---|
| (9) | Present Value of Salaries of Members during next 43 9/12 Years | $7,726,104,601 |
| (10) | Unfunded Accrued Liability Contribution Rate ((4) by (9)) | 4.151% |
| (11) | Current Contribution Rate ((7) + (10)) | 12.499% |

## SCHEDULE III

## ACTUARIAL BALANCE SHEET

| | | |
|---|---|---|
| **Assets:** | | |
| (1) Trust Fund | $142,973,994 | |
| (2) Present Value of Future Contributions for Unfunded Accrued Liability | 320,710,602 | |
| (3) Present Value of Future Contributions for Normal Costs | 186,850,307 | |
| Total Assets | | $650,534,903 |
| **Liabilities:** | | |
| (1) Present Value of Benefits - Inactive members | | |
| (a) Retirement | $127,101,226 | |
| (b) Death | 6,213,853 | |
| (c) Disability | 6,050,036 | |
| (d) Vested | 2,500,202 | |
| (e) Dormant | 625,051 | |
| (f) Tax-Sheltered Annuity | 193,328 | |
| (g) Excess Interest Payment | 31,225 | |
| | | $142,714,921 |
| (2) Present Value of Benefits - Active Members | | |
| (a) Retirement | $361,593,557 | |
| (b) Death | 41,307,081 | |
| (c) Disability | 15,932,022 | |
| (d) Vested | 60,572,632 | |
| (e) Return of Contributions | 25,896,852 | |
| (f) Legacy Fund | 22,235 | |
| (g) Tax-Sheltered Annuity | 2,495,603 | |
| Total Liabilities | | $507,819,982 |
| | | $650,534,903 |

## SCHEDULE IV

### SUMMARY OF FUND OPERATION

| | | |
|---|---|---|
| Trust Fund as of July 1, 1976 | | $122,822,013 |
| Receipts: | | |
| Contributions | | |
| Received | $23,916,374 | |
| Accrued | 2,457,243 | |
| Investment Income | | |
| Received | 9,099,279 | |
| Accrued | 305,991 | |
| | | 35,778,887 |
| Disbursements: | | |
| Benefit Payments | $13,371,099 | |
| Withdrawal Refunds | 2,046,266 | |
| Operational Expenses | 231,355 | |
| Prior Year Corrections | (21,814) | |
| | | 15,626,906 |
| Trust Fund as of June 30, 1977 | | $142,973,994 |

## SCHEDULE V

### COMPARISON SUMMARY

| | Fiscal Year Ended 1975 | Fiscal Year Ended 1977 |
|---|---|---|
| Present Value of Benefits | $456,976,945 | $650,534,903 |
| Present Value of Normal Costs | 134,228,869 | 186,850,307 |
| Unfunded Accrued Liability | 219,345,049 | 320,710,602 |
| Active Members | | |
| Number of Lives | 14,373 | 15,429 |
| Annual Payroll | $174,958,880 | $227,689,613 |
| Inactive Members | | |
| Number of Lives | 3,338 | 4,146 |
| Monthly Benefits | $ 828,653 | $ 1,283,827 |
| Contributions Based on Payroll | | |
| Employer Share | $ 10,934,930 | $ 14,371,768 |
| Employee Share | $ 10,716,231 | $ 14,087,156 |
| Assets | $103,403,027 | $142,973,994 |
| Net Investment Income | $ 6,456,664 | $ 9,405,270 |
| Net Investment Yield | 6.75% | 7.34% |

## SCHEDULE VI

SUMMARY OF ACTIVE MEMBERS

### Females

| Nearest Age | No. Of Lives | Average Service at Ret. | Average Current Salary | Average Projected Benefit |
|---|---|---|---|---|
| - 24 | 871 | 39.46 | $10,676 | $4,838 |
| 25 - 29 | 2,336 | 37.70 | 11,916 | 4,123 |
| 30 - 34 | 1,265 | 35.61 | 13,263 | 3,176 |
| 35 - 39 | 818 | 32.25 | 14,363 | 2,296 |
| 40 - 44 | 670 | 28.46 | 14,374 | 1,540 |
| 45 - 49 | 586 | 25.91 | 14,840 | 1,112 |
| 50 - 54 | 452 | 23.35 | 15,073 | 793 |
| 55 - 59 | 519 | 22.97 | 15,383 | 618 |
| 60 - 64 | 325 | 22.34 | 15,466 | 519 |
| 65 - | 43 | 20.23 | 14,237 | 445 |
| | 7,885 | | | |

### Males

| Nearest Age | No. Of Lives | Average Service At Ret. | Average Current Salary | Average Projected Benefit |
|---|---|---|---|---|
| - 24 | 360 | 39.23 | $11,486 | $5,727 |
| 25 - 29 | 1,694 | 37.33 | 12,603 | 4,735 |
| 30 - 34 | 1,574 | 35.71 | 14,722 | 3,738 |
| 35 - 39 | 1,267 | 33.43 | 17,340 | 2,980 |
| 40 - 44 | 888 | 31.64 | 19,048 | 2,303 |
| 45 - 49 | 710 | 30.26 | 19,687 | 1,732 |
| 50 - 54 | 532 | 30.01 | 20,383 | 1,377 |
| 55 - 59 | 349 | 28.84 | 21,198 | 1,090 |
| 60 - 64 | 147 | 25.26 | 20,679 | 799 |
| 65 - | 23 | 20.13 | 20,156 | 641 |
| | 7,544 | | | |

## SCHEDULE VII

### SUMMARY OF INACTIVE MEMBERS

| Form of Payment | No. Of Lives | Average Age | Average Benefit |
|---|---|---|---|
| Normal Retirement | 3,515 | 68 | $327 |
| Early Retirement | 153 | 58 | 206 |
| Disability | 175 | 63 | 273 |
| Spouse's Benefit | 235 | 62 | 207 |
| Child's Benefit | 68 | 13 | 100 |
| Total | 4,146 | 66 | $310 |
| | | | |
| Tax-Sheltered Annuity | 28 | 70 | $ 67 |

## COMMENTS

### Actuarial Position

From an actuarial standpoint, we are pleased with the progress the Teachers' Retirement System has made in adequately funding the benefits provided by the System. Although there has been a trend toward earlier retirement and a decrease in the number of terminations, the System has continued to be maintained on an actuarially sound basis. This soundness is largely due to the Board's position that all benefit increases be supported by an adequate increase in the contribution rate. As a result, while the liabilities of the system have increased, the period over which the unfunded liability can be amortized has decreased in the last two years.

Although the Teachers' Retirement System's financial position appears to be improving, we recommend that no legislative changes to improve benefits be supported by the Board without a continuation of its policy to increase the contribution rates accordingly.

The Teachers' Retirement System is now operating under a fully computerized system. This system has been very beneficial in allowing actuarial studies on the experience of the system. It has also allowed economical actuarial cost studies for proposed legislative changes.

### Quality Control

While the computer has been beneficial from an actuarial standpoint, we are concerned about the quality of the information stored on the computer. It appears that the quality has improved in the last two years, but erroneous or incomplete information still exists. We recommend that a concentrated effort be made in the next two years to improve the quality of the data. Over 90% of the erroneous data could be detected by applying parameters through a computer program to disclose inconsistent data. Such a program should be prepared and detected errors be supplied to the Teachers' Retirement System for correction.

We have reviewed the extent of erroneous data and have concluded that it did not significantly affect the results of the valuation. As a result, it is our opinion that this report fairly represents the financial position of the Teachers' Retirement System from an actuarial standpoint.

### Investment Yield

The Board of Investments prepared an report for 1976-77 showing an investment yield for the Teachers' Retirement System of 7.68%. This rate is .34% larger than the yield shown on page 12 of this report. At the request on the Teachers' Retirement Board, we have investigated the reasons for this discrepancy.

Part of the difference is attributable to the fact that the Board of Investments' figures are on a cash basis as opposed to the accrual basis used in this report. The biggest factor for the difference is that the Board of Investments does Not include uninvested assets (cash) in its calculation of the investment yield.

# SUMMARY OF BENEFIT PROVISIONS

| | |
|---|---|
| Vesting Period | 5 years. No benefits are payable unless the member has a vested right. |
| Final Average Salary | Average of 3 highest consecutive years of earnings. |
| Normal Form of Benefits | Life only annuity. All benefits cease upon death; however, in no event will the member receive less than the amount of his personal contributions with interest. |
| Normal Retirement Benefits | Minimum of 30 years service or age 60; maximum of age 70. The retirement benefit is equal to one-sixtieth (1/60) of final average salary for each year of service. The minimum benefit is equal to one-sixtieth (1/60) of $4,800 for each year of service. |
| Early Retirement Benefits | Minimum age 55; the retirement benefit is calculated in the same manner as described for normal retirement, but the monthly benefit is reduced ½ of 1% for each month early retirement precedes age 60. |
| Death Benefits | The death benefit is equal to one-sixtieth (1/60) of final average salary for each year of service accrued at date of death with an actuarial adjustment based on the relation of the member's age at death to his beneficiary's age. In addition, a child's benefit of $100/month is paid to each child under the age 18 until he attains age 18. |
| Disability Benefits | The disability benefit is equal to one-sixtieth (1/60) of final average salary for each year of service accrued at date of disability. The minimum disability benefit is equal to one-quarter (¼) of the final average salary. |

| | |
|---|---|
| Withdrawal Benefits | With less than 5 years of service, the accumulated employee contributions with interest are returned. With more than 5 years, the member may elect a refund of contributions with interest, or may leave his contributions and retain a vested right to death and retirement benefits. |
| Tax-Sheltered Annuity | The Teachers' Retirement System sponsors a tax-deferred annuity program for the benefit of its members. The policies of this program have been established in accordance with the guidelines set by the Internal Revenue Service. The benefits provided by this program are determined solely by the value of the member's account (voluntary contributions plus interest) using actuarial tables approved by the Retirement Board. |